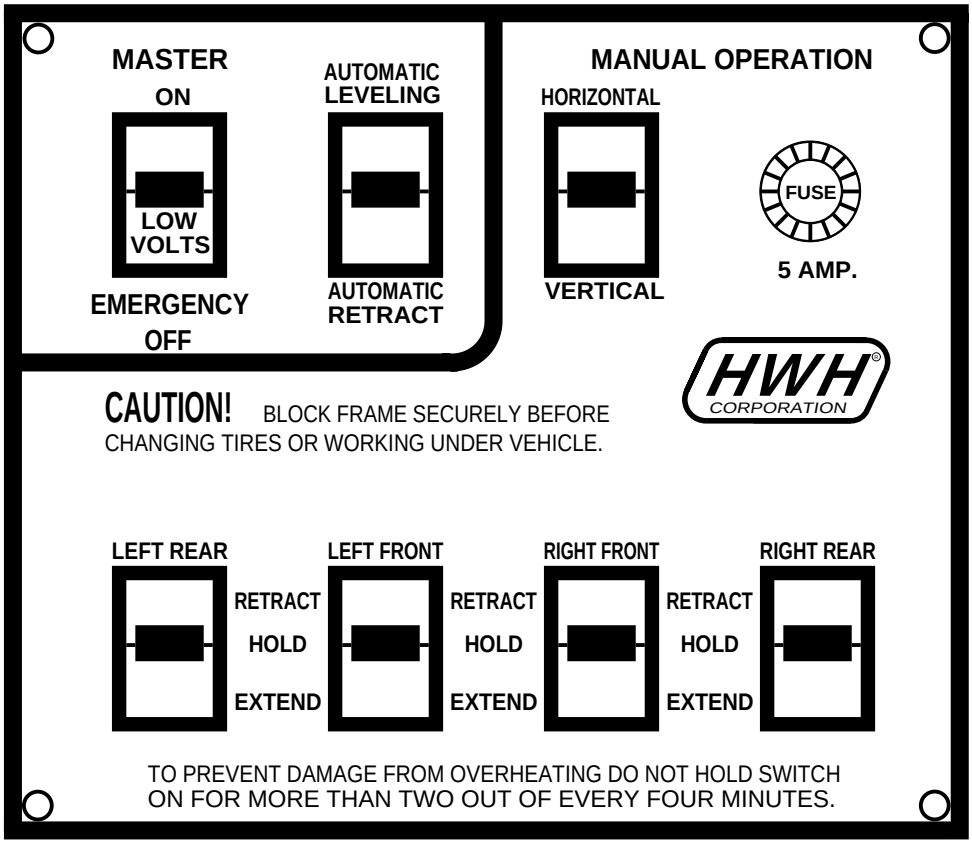
SERVICE MANUAL

HWH® COMPUTER-CONTROLLED HYDRAULIC LEVELING SYSTEM 400 SERIES

FEATURING:

Paddle Switch Control



HWH CORPORATION
(On I-80, Exit 267 South)
2096 Moscow Road | Moscow, Iowa 52760
Ph: 800/321-3494 (or) 563/724-3396 | Fax: 563/724-3408
www.hwh.com

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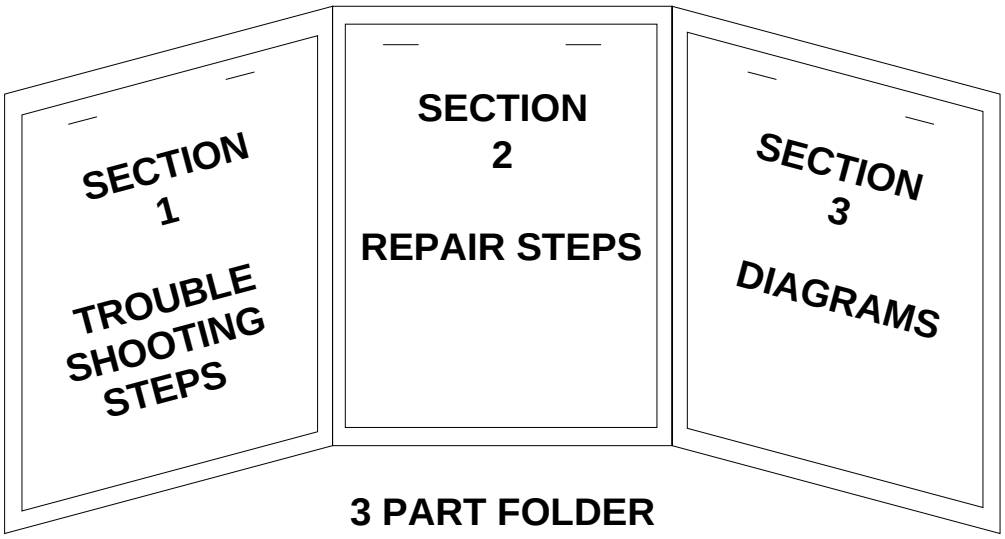
SECTION 1



3 PART FOLDER

HOW TO USE MANUAL

This manual is written in three sections. Section 1 is the Trouble Shooting Steps. Section 2 is the Repair Steps. Section 3 is the Diagrams. Begin diagnosis of the system with Section 1, the Trouble Shooting Steps. This will give the correct operation and function of the system. When a malfunction is encountered, the Trouble Shooting Steps will direct you to the proper Repair Steps in Section 2, the Repair Steps. The Repair Steps are broken into 3 columns, Problem, Solution, and Diagram. In the proper part under Problems, find the symptom you have encountered. The testing and repair for that problem is in the Solution (center) column. Diagrams for a particular Problem and Solution are in the Diagram (right hand) column. This column will direct you to the proper diagram in Section 3, Diagrams, for a more detailed view.

Before beginning your repair, it is IMPORTANT to read the CAUTIONS and NOTES AND CHECKS in the first section, TROUBLE SHOOTING STEPS. In many cases this will save time and mistakes when trouble shooting a system.

This Repair Manual is offered as a guide only. It is impossible to anticipate every problem or combination of problems. This manual is written in sequential order of the proper operation of the system. The Trouble Shooting Steps must be followed in order to give correct diagnosis of the problem(s). For any problems encountered that are not addressed in this manual, contact HWH Corporation for assistance.

NOTE: Diagrams in this manual are of typical systems. There may be plumbing or harness differences. In most cases this should not effect trouble shooting procedures.

PROCEED WITH TROUBLE SHOOTING GUIDE

TROUBLE SHOOTING

WARNING!

BLOCK FRAME AND TIRES SECURELY BEFORE CRAWLING UNDER VEHICLE. DO NOT USE THE LEVELING JACKS OR AIR SUSPENSION TO SUPPORT VEHICLE WHILE UNDER VEHICLE OR CHANGING TIRES. VEHICLE MAY DROP AND OR MOVE FORWARD OR BACKWARD WITHOUT WARNING CAUSING INJURY OR DEATH.

WHEN ROUTING OR REROUTING HYDRAULIC HOSES AND WIRES, BE SURE THEY ARE NOT EXPOSED TO ENGINE EXHAUST OR ANY HIGH TEMPERATURE COMPONENTS OF THE VEHICLE.

THE JACKS MAY ABRUPTLY SWING UP WHEN THE FOOT CLEARS THE GROUND OR WHEN THE JACK REACHES FULL EXTENSION.

NEVER PLACE HAND OR OTHER PARTS OF THE BODY NEAR HYDRAULIC LEAKS. OIL MAY CUT AND PENETRATE THE SKIN CAUSING INJURY OR DEATH.

SAFETY CLASSES ARE TO BE WORN TO PROTECT EYES FROM DIRT, METAL CHIPS, OIL LEAKS, ECT. FOLLOW ALL OTHER SHOP SAFETY PRACTICES.

DO NOT OVER EXTEND THE REAR JACKS. IF THE WEIGHT OF THE VEHICLE IS REMOVED FROM ONE OR BOTH REAR WHEELS, THE VEHICLE MAY ROLL FORWARD OR BACKWARD OFF THE JACKS.

NOTES AND CHECKS

Read and check before proceeding with Trouble Shooting Steps.

NOTE: HWH CORPORATION ASSUMES NO LIABILITY FOR DAMAGES OR INJURIES RESULTING FROM THE INSTALLATION OR REPAIR OF THIS PRODUCT.

1. The Trouble Shooting Guide must be followed in order. Problems checked for in one step are assumed correct and not checked again in following steps.

2. Check that the oil reservoir is full with the jacks in the fully retracted position.

3. Most coaches have more than one battery; one for the engine and the other(s) for the coach. The engine battery supplies power for the control box and hydraulic pump. DO NOT use the coach batteries to supply power to the pump. Batteries under no load should read 12.6 volts. Batteries must maintain good voltage under load. Batteries must be in good condition with no weak cells. An alternator, converter or battery charger will not supply enough power for the system to operate properly.

4. Proper grounding of all components is critical. See the electrical circuit for specific grounds required. Faulty grounds, especially for the control panel, solenoid manifold or the pump assembly, may cause control panel component damage and/or improper or erratic operation.

5. Do not replace the control panel unless the Repair Steps say to replace it. Otherwise the malfunctions may damage the new control box.

This manual is intended for use by experienced mechanics with knowledge of hydraulic and automotive electrical systems. People with little or no experience with HWH leveling systems should contact HWH technical service at (800-321-3494) before beginning. Special attention should be given to all cautions, wiring, and hydraulic diagrams.

Special note: When installing a new control panel, make sure the panel is properly grounded before applying power to the system.

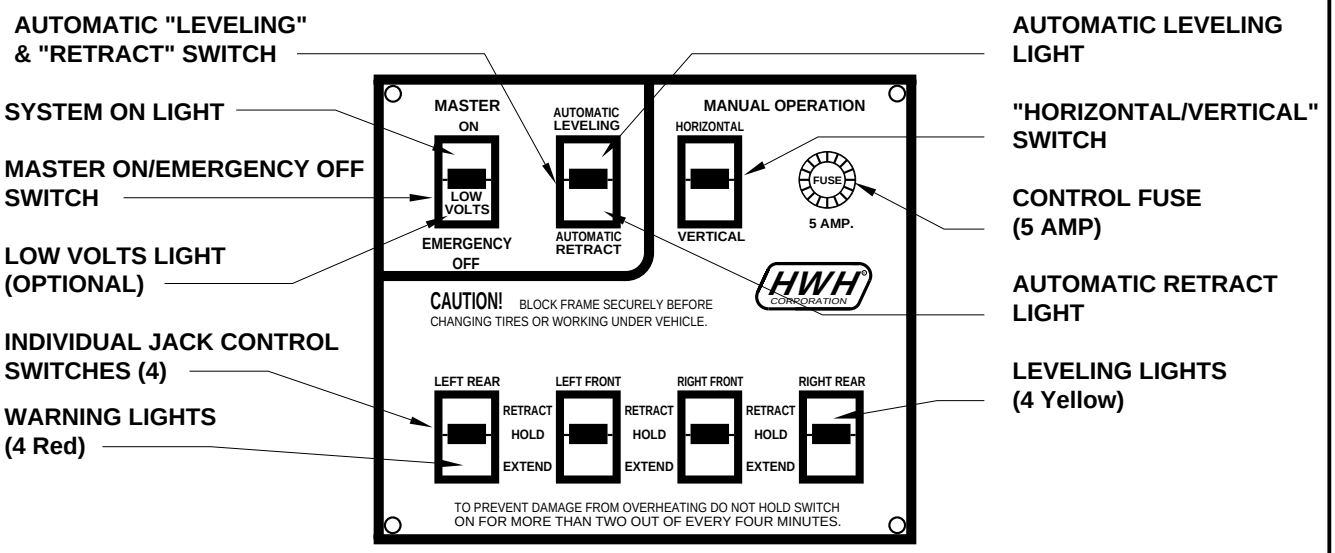
Tightening of hose ends: If tightening a new hose end, make the hose end snug (finger tight) on the fitting, then tighten the hose end 1/3 turn (2 FLATS). If tightening an existing hose end, tighten the hose end to snug plus 1/4 turn (1 FLAT).

Suggested tools for trouble shooting the HWH leveling systems:

- JUMPER WIRES(UP TO 10 GAUGE)
- PRESSURE GAUGE(3500 PSI MIN.)
- MULTI-METER
- 12 VOLT TEST LIGHT

PROCEED WITH THE TROUBLE SHOOTING STEPS ON THE FOLLOWING PAGE

TROUBLE SHOOTING STEPS



NOTE: SOME SYSTEM HAVE A REMOTE "MASTER" AND "AUTOMATIC LEVEL/RETRACT" SWITCH PANEL.

1. Make sure the transmission is in the proper position for parking and the park brake is set. With the ignition switch off, no lights on the leveling system panel should be on. If any lights are on, see Part 1 of the Repair Steps.

2. Turn the ignition switch to the ACC or ON position. The control panel should remain off. If any control panel lights come on see Part 2 of the Repair Steps.

NOTE: The red warning lights will come on when the control panel is off if a jack is extended and the ignition is on.

3. Push the "MASTER" switch to "ON". Some panels have a two position switch. Some panels have a three position momentary switch. The system on light should come on. One or two yellow lights may come on. If the pump starts running or anything else occurs see Part 3 of the Repair Steps.

NOTE: If the vehicle is equipped with straight-acting jacks, proceed to Step 5.

4. Push and hold the "HORIZONTAL/VERTICAL" switch to "VERTICAL". The pump should come on. The four jacks should drop and stay in the vertical position. The red warning lights should come on. The pump should shut off when the switch is released. If this is not so, see Part 4 of the Repair Steps.

5. Push each individual JACK CONTROL switch to "EXTEND". These are momentary switches and the jack will stop extending when the switch is released. **If the vehicle has straight-acting jacks, the respective red light for each jack should come on when the jack is extended 2 or more inches.** Make sure each jack will extend to the ground, lift the coach and remain extended when the switch is released. Be carefull not to twist the vehicle frame while performing this test. Lifting with two jacks at a time will help reduce frame twist. If the jacks do not extend properly, see Part 5 of the Repair Steps.

6. The yellow lights on the "RETRACT" side of the jack control switches are the level indicator lights. A lit yellow light indicates that corner or the vehicle is low. When all 4 yellow lights are out, the vehicle should be level. Use 2 control switches at a time to make sure all 4 yellow lights will come on at different times.

NOTE: Extending the jacks in pairs, two front, two side, or two rear, will lift the vehicle without twisting the frame.

Check that the vehicle is level with all four yellow lights out. If the yellow lights are not working properly see Part 6 of the Repair Steps.

TROUBLE SHOOTING STEPS
CONTINUED

7. Push the jack control switches to RETRACT. The foot of the jack will retract while the switch is being pushed. Kick-down jacks should stay in the vertical position.

For straight-acting jacks, the red warning light will go out when the jack is extended less than 2 inches.

The jacks cannot retract if the pump is running. Anytime the pump is running when the panel is on and a switch is NOT being pushed, refer to Part 3d of the Repair Steps.

If a jack will not retract when the control switch is pushed to retract, see Part 7 of the Repair Steps.

8. For kick-down jacks, push and hold the H/V switch to horizontal. The jacks should return to the horizontal position. The red warning lights will go out as the jacks swing horizontal. If this does not happen, see Part 8 of the Repair Steps.

At this time it is assumed that the system works correctly in the manual mode. Any time the pump runs with the panel on and no switches being pushed, refer to Part 3d of the Repair Steps. Proceed with checking the system in the automatic mode.

AUTOMATIC LEVELING

IMPORTANT: Anytime the master switch is turned off or the ignition switch is turned to another position, the microprocessor is reset. Any automatic procedure in progress must be restarted.

9. Turn the ignition switch to the ACC or ON position. Push the master switch to ON. If the system does not turn on, return to Part 3 of the Trouble Shooting Steps. Push the Automatic switch to AUTOMATIC LEVELING. The following should occur:

For systems with straight-acting jacks, proceed to Step 10.

a. The automatic leveling light will start to blink.
b. The pump will come on.
c. The jacks will drop to the vertical position.
d. The pump will shut off several seconds after the jacks are vertical.
e. The red warning lights will be on.
f. The automatic leveling light should glow steady.

If any of this does not occur, see Part 9 of the Repair Steps.

10. Push the AUTOMATIC LEVELING switch to AUTOMATIC a second time. (For straight-acting jacks push the AUTOMATIC LEVELING switch to LEVELING the first time.) The following should occur:

a. The automatic leveling light will start to blink.
b. For systems with automatic air dump, the air will start to dump from the vehicle suspension. After approximately 30 seconds, the system will start to level the vehicle.
c. The jacks will extend according to lit yellow leveling lights.
d. For systems with straight-acting jacks. The red warning lights will come on as the jacks extend 2 or more inches.
e. After all yellow lights go out, the system will pause then stabilize the vehicle. Depending on the system, the pump will run for a specific amount of time then shut off.
   a. 20 seconds for most systems.
   b. 10 seconds for systems with air dump.
   c. 60 seconds for Blue Bird coaches with straight-acting jacks.
f. The automatic leveling light will stop blinking and the control panel will shut off.

NOTE: Systems with 2 position master switches must be turned off manually.

If any of the above does not occur, see Part 10 of the Repair Steps.

AUTOMATIC RETRACT

11. Push the master switch to "ON". Push the automatic switch to "Retract". The following should occur:

a. The red automatic retract light should start to blink.
b. The jacks should retract. Kick-down style jacks will return to the horizontal position.
c. The individual red warning lights will go out.
d. Four minutes after the last warning light goes out, the automatic retract light will go out and the panel will shut off.

NOTE: Systems without the automatic off feature will have to be turned off manually.

If any of the above does not occur, see Part 11 of the Repair Steps.

SECTION 2

REPAIR MANUAL

HWH COMPUTER-CONTROLLED LEVELING SYSTEMS 400 SERIES

FEATURING:

PADDLE SWITCH CONTROL

KICK-DOWN JACKS

OR

STRAIGHT-ACTING JACKS

OPTIONAL AUTOMATIC SUSPENSION AIR DUMP

BEGIN WITH SECTION 1

HWH CORPORATION
2096 MOSCOW ROAD/P.O. BOX 0183
MOSCOW, IOWA 52760-0183
800-321-3494 / 319-724-3396
INTERNET: http: //www.hwhcorp.com

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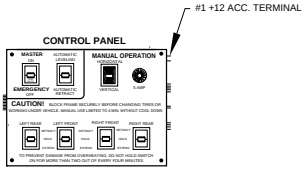
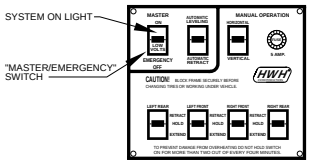
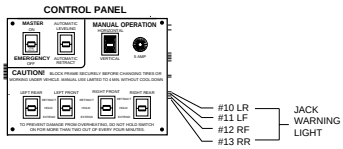
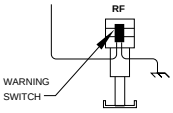
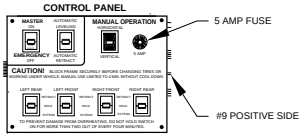
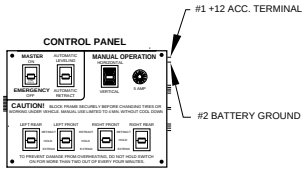
REPAIR STEPS

PROBLEM	SOLUTION	DIAGRAMS
Part 1 **With the ignition switch off:** a. The control panel has lights on.	There should be no power on pin #1 of the control panel. Trace the wire to its source. The wire should be connected to the ACC side of the ignition switch.	 **REFER TO MP85.3455**
Part 2 **With the ignition switch in the ACC or ON position and the control panel off:** a. The system ON light is lit.	If the control panel has a two position master switch, make sure the switch is in the "OFF" position. If the light remains on, the control panel should be repaired or replaced.	 **REFER TO MI91.1065**
b. A red warning light is lit and no jacks are extended or in the vertical position.	Unplug the wires to the JACK WARNING LIGHT pins. If the warning light does not go out, replace the panel. If the warning light goes out, plug the wires back in and disconnect the jack warning switch from the harness. If the light goes out replace the switch. If the light does not go out, the harness wire is shorted to ground and should be repaired.	 **REFER TO MP85.3455**  **REFER TO MP85.3454**
Part 3 **With the MASTER switch "ON":** a. The system on light will not come on. No other lights come on and the system will not function.	Check the 5 amp fuse in the control panel.	 **REFER TO MP85.3455**
	If the fuse is not blown, check Pin 1 of the control panel or +12 volts. Check Pin 2 for ground. If +12 and ground are present, the control panel should be repaired or replaced. If +12 or ground is not present, trace those wires to their source and repair. The ground should be a good frame ground.	 **REFER TO MP85.3455**

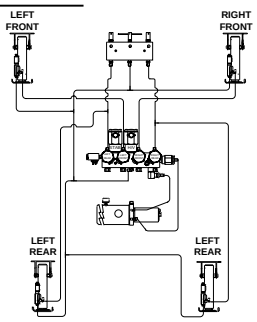
REPAIR STEPS

PROBLEM	SOLUTION	DIAGRAMS
Part 3a continued	**If the fuse is blown,** unplug the 11 pin harness, pins 14-24. Replace the fuse and turn the master switch on again. If the fuse blows, check that the wire connected to pin #9 is not shorted to ground. If pin #9 is ok, replace the control panel.	
	If the fuse does not blow, plug the 11 pin harness back into the panel. If the fuse does not blow, continue with the repair. If the fuse blows when the 11 pin harness is plugged in, there is a short in the master relay circuit. Use the master and pump relay connection diagram for the following tests. Unplug connection A. Replace the fuse and turn the master switch on. If the fuse blows, the red wire in the control harness is shorted to ground. If the fuse does not blow, unplug connection B then plug in connection A. If the fuse blows, replace the fuse board. If the fuse does not blow, disconnect the red wire from Terminal 2 of the master relay. Plug in connection B. With the panel ON if the fuse blows, the red wire in the pump harness is shorted to ground. If the fuse does not blow, replace the master relay.	**REFER TO MP85.3455** **REFER TO MP85.3460**
b. The system ON light will not come on. Leveling lights will come on and the system functions.	The bulb may be burnt out. Remove the lens and use the clip under the lens to remove the bulb. If a new bulb does not fix the problem, the switch needs to be repaired.	**REFER TO MI91.1065**
c. Three yellow leveling lights or opposing leveling lights come on. (Right front and left rear or left front and right rear.)	Unplug the 5 wire sensing unit plug from the control panel. Use a test light connected to ground to test the panel. Touch pins 4, 5, 6 and 7. The appropriate light for that pin should come on. Only one light at a time should come on. If the lights do not work properly, replace the panel. If the panel works properly, replace the sensing unit.	**REFER TO MP85.3455**

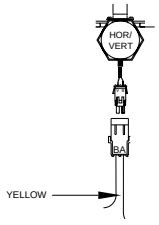
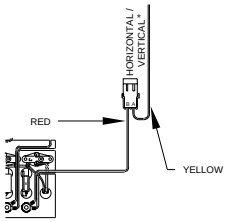
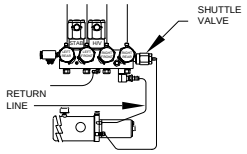
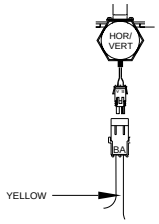
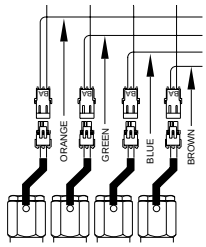
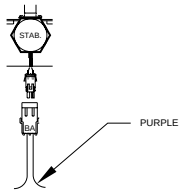
REPAIR STEPS

PROBLEM	SOLUTION	DIAGRAMS
Part 3 continued		
d. The pump runs.	Use the master and pump relay connection diagram for this repair. Disconnect the gray wire from Terminal 6 of the pump relay. Turn the system on. If the pump runs, replace the pump relay. If the pump does not run, reconnect the gray wire. With the system on, if the pump does not run, the pump relay was stuck. Check and clean all connections and check battery voltage. Low battery voltage or corroded connections can cause a relay to stick. If the pump runs with the panel on, turn the panel OFF. Unplug connection B. Use a jumper to connect Terminal 1 and Terminal 2 of the master relay. If the pump runs, the gray wire in the pump harness is shorted to ground. If the pump does not run, unplug connection A and plug in connection B. With Terminals 1 and 2 jumped together, the pump runs, replace the fuse board. If the pump does not run, unplug the 11 pin plug from the control panel. Plug in connection A. With Terminals 1 and 2 jumped together, the pump runs, the gray wire in the control harness is shorted to ground. If the pump does not run, replace the control panel.	**REFER TO MP85.3460**
e. The air starts to exhaust from the vehicle suspension.	Unplug connection C at the fuse panel. Turn the master switch on again. If air exhausts from the suspension, replace the fuse panel (breaker board). If air does not exhaust from the suspension, check that the black wire for the air dump in the control harness is not shorted to the red wire in the control harness. If the harness is ok, replace the control panel.	**REFER TO MP85.3466**
Part 4 **While pushing the horizontal/vertical switch toward vertical:**		
a. The pump will not run.	Use the master and pump relay connection diagram for this test. Connect a test light to Terminal 3 of the master relay. With the control panel "ON", check Terminals 1, 2, 4, 5 and 7 of the master and pump relays. The control panel must be ON, the H/V switch does not have to be pushed. **If there is no power at Terminal 1** check that the connection at Terminal 3 is tight, clean and not corroded. Check that the wire to Terminal 3 is good and has a solid, clean ground connection. This is ground for the master relay. If not, fix those connections. If there is a good ground to Terminal 3 and no power on Terminal 1, check the connection at Terminal 1. Check the battery connections and battery voltage. Check the battery ground. Terminal 1 must have a good +12 volt supply from the battery. Make sure the pump has a good solid, clean frame mounting or connection.	**REFER TO MP85.3460**

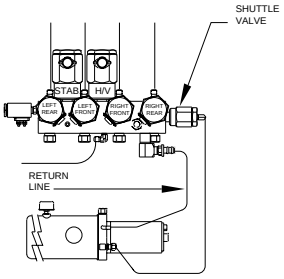
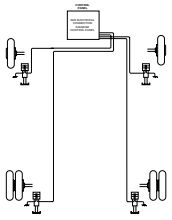
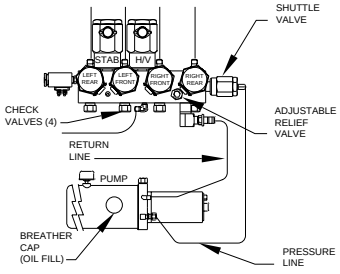
REPAIR STEPS

PROBLEM	SOLUTION	DIAGRAMS
Part 4a continued	**If there is no power at Terminal 2,** check pin 14 at the control panel. If there is no power at pin 14, replace the control panel. If there is power at pin 14, there is a problem with connection A or B or with the red wire in the control harness or pump harness. **If there is no power at Terminal 4,** check the connection at Terminal 3. Make sure it is a good ground. If the ground is good, replace the master relay. **If there is no power at Terminal 5 or 7,** there is a problem with the wires between Terminal 4 and Terminal 5 or 7 or the connections at those terminals need to be fixed. **If Terminals 1, 2, 4, 5, and 7 have power, check Terminal 8 of the pump relay while the Horizontal/Vertical switch is being pushed to "VERTICAL".** **If there is no power on Terminal 8,** connect the test light to Terminal 1 to check Terminal 6 for ground while the switch is being pushed. If Terminal 6 has a ground and Terminal 8 has no power, replace the pump relay. **If there is power on Terminal 8,** check Terminal 9 on the pump motor for power. If Terminal 9 has power, check that the pump has a good frame ground. If the pump ground is ok, the pump motor needs to be rebuilt or replaced. If Terminal 9 has no power, the cable between Terminals 8 and 9 or the connections at Terminals 8 and 9 need to be fixed. **If there is no ground to Terminal 6 while the H/V switch is being pushed to "VERTICAL",** there is a problem between the gray wire at Terminal 6 and the control panel. Use a jumper wire to ground Terminal 6 with the control panel ON to make sure the pump will run. Turn the panel "OFF". Use a jumper wire between Terminal 1 and 2 of the master relay to turn that relay on. Check for power at the main stud of the fuse board. If there is no power, there is a problem with the #10 black wire or its connections at the main stud or Terminal 4 of the master relay. If there is power at the main stud of the fuse board, unplug the 11 pin plug from the control panel. Ground the gray wire in the plug. If the pump runs, replace the control panel. If the pump does not run, unplug connection A. Ground the pin for the gray wire in the male plug. If the pump runs, the gray wire in the control harness is bad. If the pump does not run, unplug connection B. Ground the pin for the gray wire in the male plug. If the pump runs, replace the fuse board. If the pump does not run, the gray wire in the pump harness is the problem and must be fixed.	
b. One jack will not swing vertical. The pump does run.	Each jack has an actuator that forces the jack into the vertical position. The actuator pushes against a roller bearing or bushing. Each jack also has a horizontal stop. Make sure the stops are in place and properly adjusted. Make sure the roller bearing or bushing is in place and turns freely. Make sure the jack can be pulled into the vertical position. Hydraulically, all four actuators are connected to the same manifold valves. Check the fluid level in the reservoir. With all the jacks completely retracted, the fluid should be within one inch of the top of the reservoir.	 **REFER TO MP65.3455**

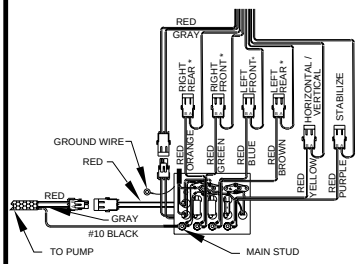
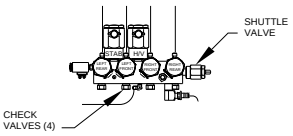
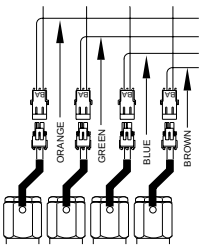
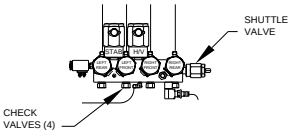
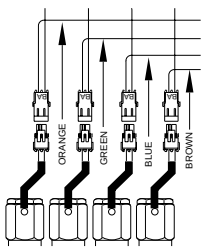
REPAIR STEPS

PROBLEM	SOLUTION	DIAGRAMS
Part 4 continued		
c. The pump runs under load. No jacks go vertical.	Unplug the H/V valve. With the system on, check for +12 on the red wire in the female plug. **If +12 is not present,** check the fuse at the fuse board for that valve. Two valves are connected to each fuse. **(Older fuse boards have 3 circuit breakers and some older boards have 2 circuit breakers with 3 valves connected to each breaker.)** If the fuse is blown (or breaker is tripped) replace the fuse. (Let the breaker reset.) With the system ON (leave the H/V valve unplugged) if the fuse blows again or the breaker will not reset, the other valve connected to that fuse (breaker) should be replaced. If the fuse does not blow, plug the H/V valve back in. With the system on, if the fuse blows or the breaker trips, replace the H/V valve. **If +12 is present on the red wire,** check for ground on the yellow wire in the plug while pushing the H/V switch to vertical. A test light can be connected to the main stud on the fuse board to check for ground. If the yellow wire has a ground, replace the H/V valve. If not, the yellow wire or control panel is bad.	 **REFER TO MP85.3462**  **REFER TO MP85.3300** **REFER TO MP85.3305**
d. The pump runs under no load. The jacks will not go vertical, no jacks are extending.	Check that the fluid reservoir is properly filled. Remove the return line at the pump. Unplug the H/V valve. Push the H/V switch to VERTICAL. If fluid flows from the return line, replace the shuttle valve. If no fluid flows from the return line, plug the H/V valve back in and try again. If fluid flows from the return line, replace the bleed valve. If no fluid flows from the return line, check voltage to the pump. Connect a 5000 psi pressure gauge to the pressure port of the pump. If the pressure is less than 3000 psi, the pump should be repaired.	 **REFER TO MP65.3455**  **REFER TO MP85.3462**
e. The jacks do not swing vertical, one or more jacks extend in the horizontal position. The foot of the jack(s) retract after the H/V switch is released.	Unplug the solenoid valve for the jack that is extending in the horizontal position. Plug that connector onto a solenoid valve that is not extending. Push the H/V switch to VERTICAL. If the problem changes to a different jack, the control panel or the harness is the problem. If the jacks swing vertical and no jacks extend, the valve that is unplugged should be replaced.	 **REFER TO MP85.3462**
f. The jacks do not swing vertical, all four jacks extend in the horizontal position.	Unplug the stabilize solenoid valve. Push the H/V switch to vertical. If the jacks go vertical, check for power between the purple and red wire in the stabilize plug. If power is present while pushing the H/V switch, the problem is the control harness or the control panel. If power is not present, replace the stabilize valve. If the jacks still extend in the horizontal position with the stabilize valve unplugged, replace the stabilize valve.	 **REFER TO MP65.3452**

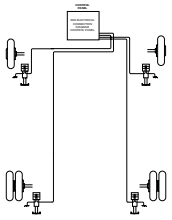
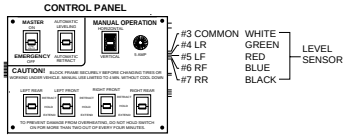
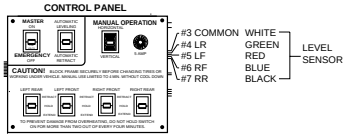
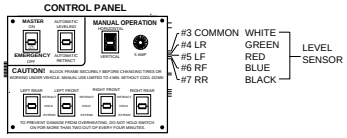
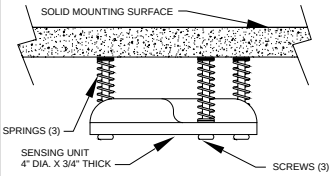
REPAIR STEPS

PROBLEM	SOLUTION	DIAGRAMS
Part 4 continued g. The jacks swing vertical but retract to the horizontal position when the H/V switch is released.	Push the H/V switch to VERTICAL. After the jacks are vertical, push the MASTER SWITCH TO OFF before releasing the H/V switch. If the jacks stay vertical, replace the H/V valve. If the jacks still retract to the horizontal position, remove the return line from the pump. While pushing the H/V switch to vertical, watch the return line. If fluid flows from the return line, replace the bleed valve cartridge. If that does not fix the problem, replace the H/V valve and the shuttle valve. The actuators for 16,000 lb jacks can cause this problem. If the above solution does not fix the problem, disconnect the hydraulic line to one of the 16,000 lb jacks and cap the line. Retry the H/V switch. If the jacks stay vertical, replace the actuator for the jack that is disconnected. If the jacks still retract, replace the actuator for the remaining 16,000 lb jack.	 **REFER TO MP65.3455**
h. The red light for a jack will not come on when the jack is vertical.	Ground the wire for that warning switch at the jack. If the light comes on, check the ground for that switch. If the ground is OK, replace the switch. If the light does not come on, unplug the warning light wire from the control panel. Use a test light connected to ground to ground the pin for the red light that does not work. If the light comes on, the harness wire is bad. If the light does not come on, replace the bulb or have the control panel repaired.	 **REFER TO MP85.3454**
Part 5 **With an individual jack control switch pushed to "EXTEND":** a. The pump does not run.	If the vehicle is equipped with straight-acting jacks, refer to Part 4a. Replace the use of the H/V switch with a jack control switch in the EXTEND position. If the vehicle is equipped with kick-down jacks, it is assumed the pump and relays work. Push the H/V switch to VERTICAL. If the pump runs, but not when a jack control switch is pushed to EXTEND, the control panel needs to be repaired or replaced. If the pump does not run when the H/V switch is pushed, return to Part 4a of the Repair Steps.	
b. For straight-acting jacks. The pump runs. The jacks will not extend or will extend but not pick up the vehicle.	Remove the return line from the pump. Push a jack control switch to extend. If fluid flows out of the return line, replace the shuttle valve. If no fluid flows from the return line, check voltage to the pump motor while it is running. Low voltage will cause low pump pressure. Connect a 5000 psi pressure gauge to the pressure fitting at the pump. If there is less than 3000 psi while the pump is running, the pump should be repaired. Remember to check the fluid level in the reservoir.	 **REFER TO MP65.3455**

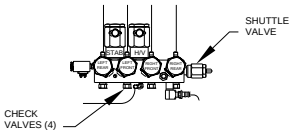
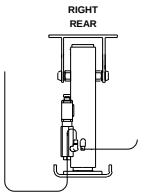
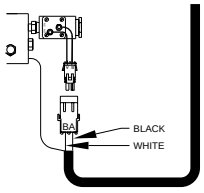
REPAIR STEPS

PROBLEM	SOLUTION	DIAGRAMS
Part 5 continued		
c. The pump runs under load. A jack will not extend.	Check the fuse or breaker for that solenoid valve at the fuse (breaker) panel. Check that there is +12 power on the main stud and the connection terminals at the fuse (breaker) panel. **If the fuse is blown,** unplug the valve that will not extend. Two valves will be connected to each fuse (breaker). Replace the fuse or let the breaker reset. With the system ON, if the fuse blows or breaker trips, replace the solenoid valve that is connected to that fuse (breaker). If the fuse does not blow, plug the unplugged valve back in. If the fuse blows, replace that solenoid valve. **If the fuse is not blown,** unplug the solenoid valve for the jack that will not extend. While pushing the jack control switch to EXTEND, check for power between the two pins of the harness plug. If power is not present, the problem is the harness or the control panel. If power is present, replace the solenoid valve.	 **REFER TO MP85.3300**
d. More than one jack extends when a jack control switch is pushed to "EXTEND".	**If the system has kick-down jacks** the problem is a short in the control harness or the control panel needs to be rebuilt. **If the system has kick-down or straight-acting jacks and all four jacks extend,** when one switch is pushed but not when other control switches are used, replace the check valve for the jack that lets all four extend. **If the system has straight-acting jacks,** try all four jack control switches. If the same jack extends no matter which switch is pushed, replace the solenoid valve. **NOTE:** The wire for that valve in the control harness could be shorted to ground. Check for power between the two pins in the plug for that valve while pushing another switch to extend. If power is present, the wire is shorted. If not, replace the solenoid valve. If only one switch runs two jacks, the control panel should be repaired.	 **REFER TO MP65.3455**  **REFER TO MP85.3462**
e. A jack will not stay extended when the switch is released.	While pushing the jack control switch to EXTEND, push the MASTER switch to "OFF". **If the jack retracts,** the problem is either the solenoid valve or the check valve. Replace the solenoid valve. If that does not fix the problem replace the check valve. **If the jack does not retract,** unplug the solenoid valve for that jack. With the panel on, check for power between the 2 pins of the harness plug for that jack. If power is present, the harness wire is shorted to ground or the control panel is bad. If power is not present, replace the solenoid valve.	 **REFER TO MP65.3455**  **REFER TO MP65.3462**

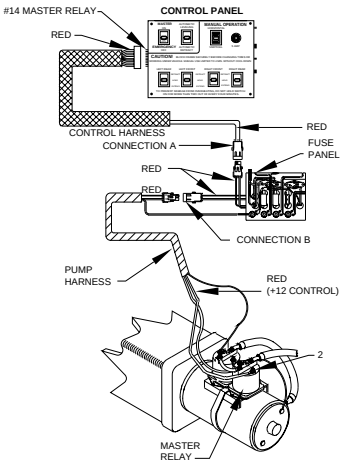
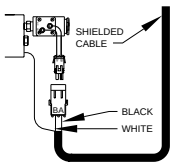
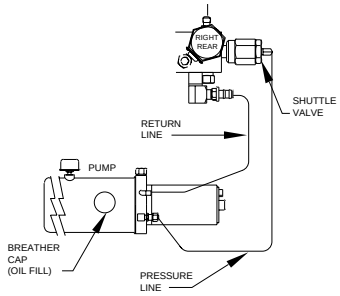
REPAIR STEPS

PROBLEM	SOLUTION	DIAGRAMS
Part 5 continued **f. For straight-acting jacks.**A red warning light will not come on when the jack is extended 2 inches or more.	Ground the warning switch wire at the jack. **If the light comes on,** check the ground for the warning switch. If the ground is ok, replace the warning switch. **If the light does not come on,** unplug the warning light wires at the control panel. Use a test light to ground the pin for the light that will not come on. If the light comes on, the problem is the wire. If the light does not come on, check the bulb. If the bulb is ok, repair or replace the control panel.	 **REFER TO MP85.3454**
Part 6 **The yellow lights will not work properly.** a. A yellow light will not come on.	Unplug the sensing unit plug from the control panel. With the panel on, use a test light to ground the pin for the yellow light that does not work. If the light does not come on, check the bulb, then replace the panel if the bulb is ok. If the light does come on, replace the sensing unit.	 **REFER TO MP85.3455**
b. No yellow lights come on.	Unplug the sensing unit plug from the control panel. With the panel on, use a test light to ground pins 4, 5, 6, and 7. If the yellow lights come on as they should, connect the test light to a +12 source. Check the #3 pin (common). If the test light comes on the panel is ok, replace the sensing unit. If the above test does not work, check the bulbs, then replace the control panel if the bulbs are ok.	 **REFER TO MP85.3455**
c. Yellow lights will not go out.	Unplug the sensing unit plug from the control panel. If the lights do not go out, replace the control panel. If the lights go out, use a test light to ground pins 4, 5, 6 and 7. If the lights do not work properly, replace the panel. If the lights work ok, replace the sensing unit.	 **REFER TO MP85.3455**
d. The vehicle is not level with all the yellow lights out.	Adjust the sensing unit according to the level sensing unit adjustment sheet.	 **REFER TO MP85.9505**
Part 7 **While pushing a jack control switch to RETRACT:** a. The pump is running.	Refer to Part 3d of the Repair Steps.	

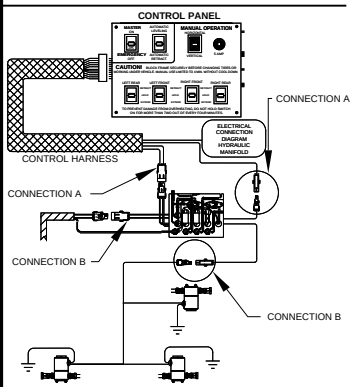
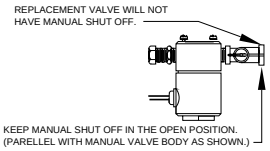
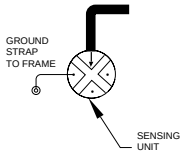
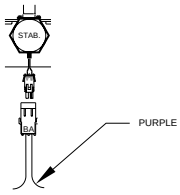
REPAIR STEPS

PROBLEM	SOLUTION	DIAGRAMS
Part 7 continued		
b. A jack will not retract.	Try to extend the jack. If the jack will not extend, return to Part 5 of the Repair Steps. If the jacks will extend, the solenoid valve and fuse panel (breaker panel) are ok. Take the hose loose from the jack, if the jack retracts, check the hose for kinks or restrictions. If the hose is ok, replace the solenoid valve. If the jack does not retract, replace the jack if it is a straight-acting jack. If it is a kick-down jack, remove the tube between the jack and the actuator or loosen the actuator clamps on the 16,000# jacks. If the jack retracts, replace the actuator. If the jack doesn't retract, replace the jack.	
c. No jack will retract.	Try to extend the jacks. **If the jacks will not extend, return to Part 5 of the Repair Steps.** If the jacks will extend, the solenoid valves and fuse panel (circuit breaker panel) are ok. Check the return line for kinks. If the return line is ok, replace the shuttle valve.	 **REFER TO MP65.3455**
d. For straight-acting jacks. A red warning light will not go out when the jack is retracted.	Refer to Part 2b of the Repair Steps.	
Part 8 **When the H/V switch is pressed to HORIZONTAL:**		
a. A jack will not return to the horizontal position.	Check that the hose to the actuator is not kinked. Check that the roller assembly is ok. Check that the jack pivot points are free. If this is ok, replace the actuator.	**REFER TO MP65.3455**
b. A red warning light will not go out when the jacks are in the horizontal position.	Refer to Part 2b of the Repair Steps.	
Part 9 **After pushing the Automatic Leveling switch to Leveling one time:**		
a. The Automatic Leveling light will not blink.	Replace the control panel.	
b. The leveling light comes on and blinks. The pump runs approximately 2 seconds and shuts off. The jacks do not go vertical.	Unplug the pressure switch. Retry Part 9. If the jacks go vertical, replace the pressure switch. If the same problem repeats itself, check the pressure switch wires to make sure they are not shorted to ground. If the wires are ok, replace the control panel.	 **REFER TO MP85.3462**

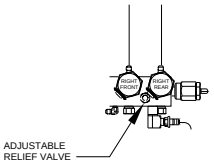
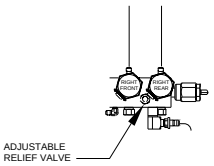
REPAIR STEPS

PROBLEM	SOLUTION	DIAGRAMS
Part 9 continued c. The leveling light comes on and blinks for approximately 30 seconds. The pump does not run. The jacks do not go vertical.	Recheck Part 4 of the Trouble Shooting Steps. If the system works properly in the manual mode. The problem is probably the fuse board (breaker board). Replace the fuse board. If that does not fix the problem, replace the control panel. Remember the manifold mounting and pump mounting, supply grounds for the system and should be checked for clean, tight connections to the vehicle frame.	 **REFER TO MP85.3460**
d. The jacks go to the vertical position but the pump will not shut off.	Unplug the pressure switch. Turn the system on and push the automatic leveling switch to LEVELING. As the jacks go vertical, short the two pins in the harness plug for the pressure switch together. **If the pump does not shut off,** check the pressure switch wires in the harness. If the pressure switch wires are ok, replace the control panel. **If the pump shuts off,** check the return line to the pump while pushing the H/V switch to VERTICAL. If there is fluid flowing from the return line, replace the shuttle valve. If no fluid flows from the return line, remove the pressure line from the pump and attach a 5000 psi gauge to the pump fitting. Push the H/V switch to VERTICAL. If the pump pressure is above 3000 psi, replace the pressure switch. If pump pressure is below 3000 psi, check the voltage and ground for the pump. If that is ok, have the pump rebuilt.	 **REFER TO MP85.3462**  **REFER TO MP65.3455**
e. The red lights do not come on.	Recheck Part 4h of the Repair Steps.	
f. The automatic leveling light will not stay on.	Recheck the voltage to the panel. Check all grounds and connections. Low voltage, bad grounds, or loose, corroded connections can cause problems.	
Part 10 **After pushing the Automatic Leveling switch to leveling the second time:** a. The leveling light will not blink or blinks but nothing happens.	A problem can occur at any time. For systems with kick-down jacks, turn the panel off, then recheck Part 9 of the Trouble Shooting Steps. If Part 9 checks ok, the control panel should be repaired. For systems with straight-acting jacks, refer to Part 9a, b and c of the Repair Steps. Replace "go vertical" with "extend".	

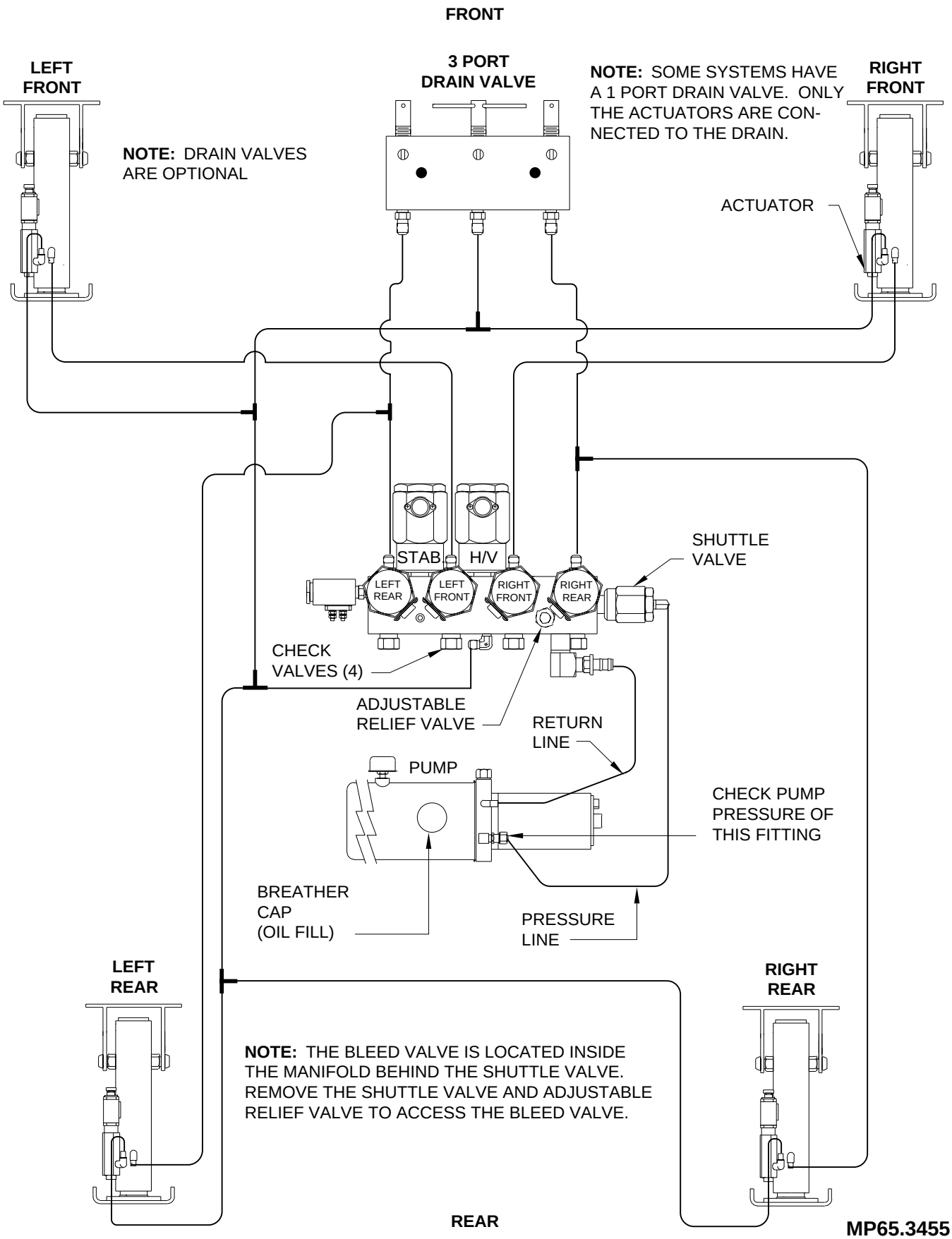
REPAIR STEPS

PROBLEM	SOLUTION	DIAGRAMS
Part 10 continued **b. For systems with automatic air dump:** The automatic leveling light is blinking but the air will not exhaust from the vehicle suspension.	Check that the manual shut off on the air dump valves are open and that the dump ports are clear of debris. Make sure the grounds for the dump valves are good connections and not corroded. With the automatic leveling light blinking, check the black wire in the control harness at connection A. If +12 is not present, check that the black wire is not broken then replace the control panel. If +12 is present at connection A, check the black wire from the fuse panel at connection B. If +12 is not present, replace the fuse panel. If +12 is present, the problem is the dump valves, their grounds or the wiring from connection B to the valves.	 **REFER TO MP85.3466**  **REFER TO MP75.3453**
c. For straight-acting jacks. The pump runs, but nothing happens.	Recheck the system in the manual mode. If the system works manually but not automatically the control panel should be repaired.	
d. For straight-acting jacks. The red lights do not come on as the jacks extend.	Recheck Part 5f of the Repair Steps.	
e. For straight-acting jacks. The pump runs approximately 2 seconds then shuts off.	Refer to Part 9b of the Repair Steps.	
f. The vehicle will not level itself according to the yellow lights.	Retry the system in the manual mode. Check all connections, grounds and voltage. The ground straps for the sensing unit and the pressure switch wire are shielding cables. Poor grounds of these wires can cause problems in the automatic mode. If everything is ok, the problem is in the control panel.	 **REFER TO MP85.3454**
g. Jacks do not extend to stabilize the vehicle. The pump runs under a load.	The stabilize valve is not opening. Retract the jacks and unplug the leveling sensing unit from the control panel. Unplug the stabilize valve and plug the harness plug for the stabilize valve into one of the jack control valves. Run the system through the automatic mode. With no yellow lights on the system will go into the stabilize mode immediately. If the jack that is connected to the stabilize plug extends, replace the stabilize valve. If the jack does not extend, the problem is the control panel.	 **REFER TO MP85.3462**

REPAIR STEPS

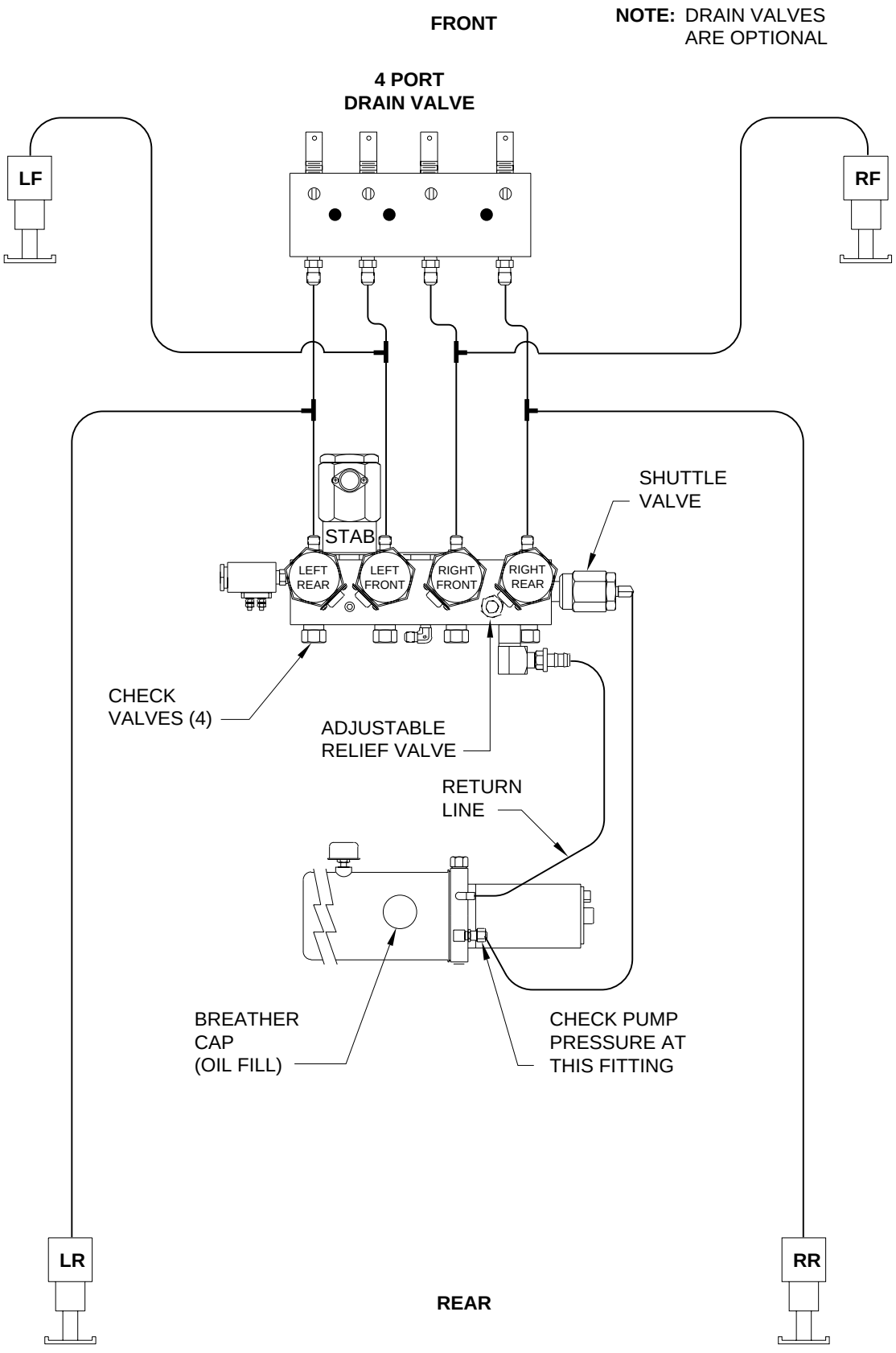
PROBLEM	SOLUTION	DIAGRAMS
Part 10 continued		
h. Jacks do not extend to stabilize the vehicle. The pump runs under no load.	The adjustable relief valve is not working properly and should be replaced.	 **REFER TO MP65.3455**
i. Jacks extend to stabilize the vehicle, but lift the vehicle too high or do not extend to the ground fully.	The relief valve needs to be adjusted. Loosen the jam nut. If the vehicle is lifting too high, turn the adjusting bolt counterclockwise. If the vehicle needs more pressure on the jacks to stabilize, turn the adjusting bolt clockwise. Turn the adjusting bolt 1/2 turn at a time and retry the system. Repeat until the proper adjustment is reached. If adjustments do not help, replace the relief valve.	 **REFER TO MP65.3455**
j. The pump does not shut off.	Turn the master switch off. If the pump stops turn the master switch back on. If the pump starts to run see Part 3d of the Repair Steps. If the pump does not run the control panel may be the problem. Retry the automatic leveling function. If it works ok, the problem was a stuck relay. Check voltage and all connections.	
Part 11 **After turning the master switch "ON" and pushing the Automatic Switch to "RETRACT":**		
a. The red "RETRACT" light does not blink.	Check voltage and connections. Check the bulb. If the system works manually and levels automatically, the problem is the control panel.	
b. The pump does not run when the master switch is turned "ON" but starts to run when the Automatic Switch is pushed to "RETRACT".	Replace the control panel.	
c. One or more jacks will not retract or the red warning lights do not go out.	Recheck the system in the manual mode. Any problem occuring at this time can be found by operating the system manually.	
d. The control panel will not shut off.	Replace the control panel.	

HYDRAULIC LINE CONNECTION DIAGRAM
400 SERIES LEVELING SYSTEM
WITH KICK-DOWN JACKS



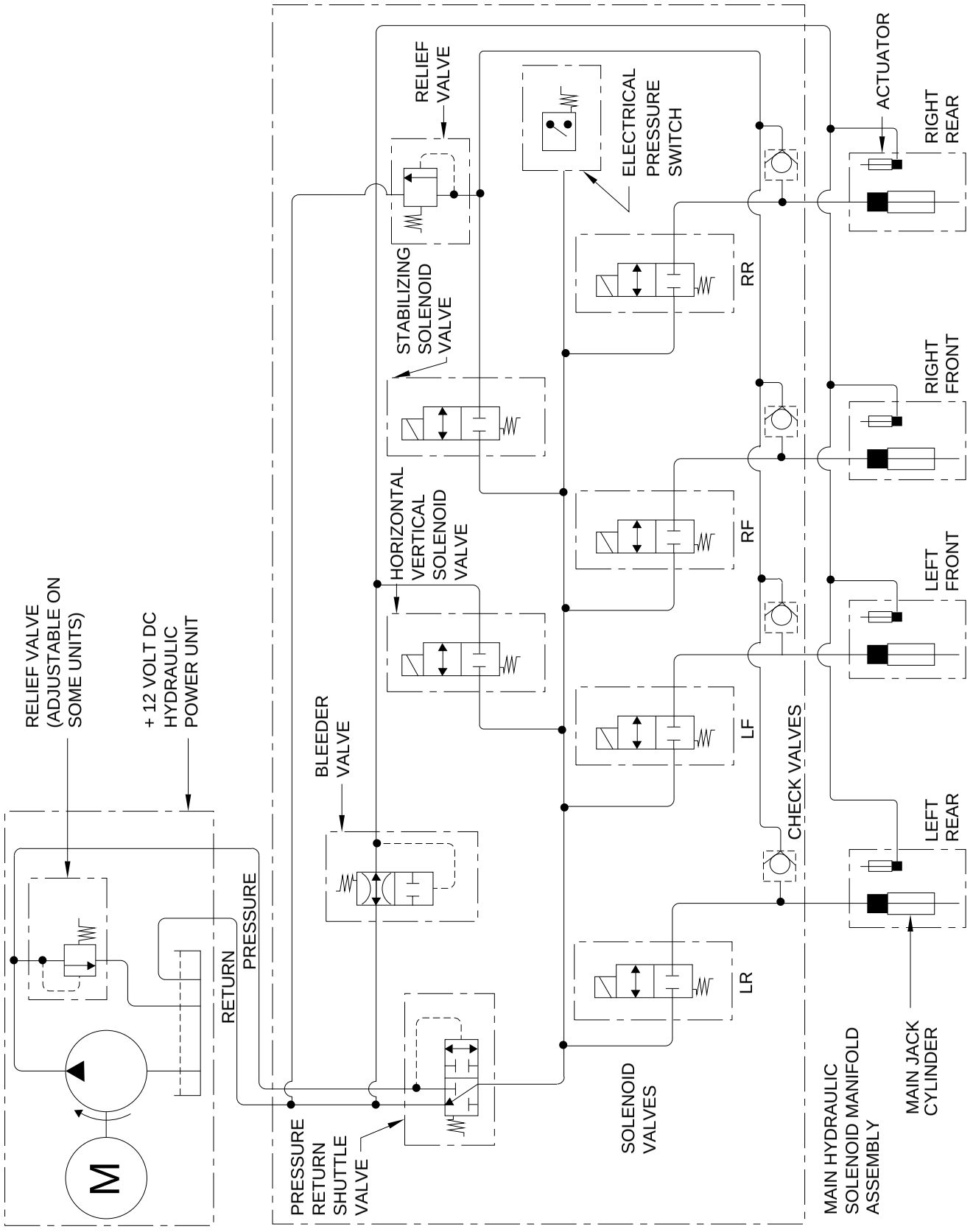
MP65.3455
03FEB98

HYDRAULIC LINE CONNECTION DIAGRAM
400 SERIES LEVELING SYSTEM
WITH STRAIGHT-ACTING JACKS



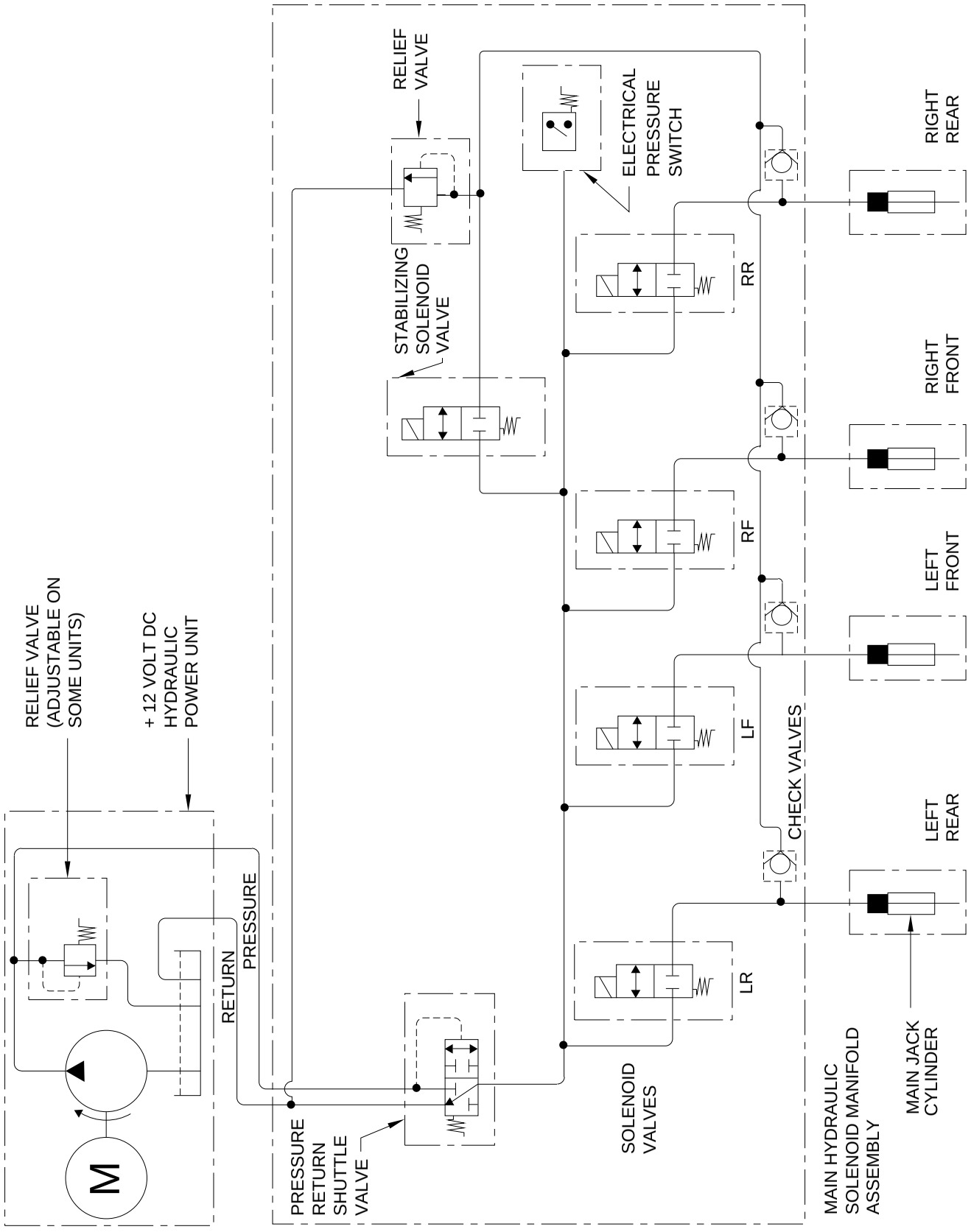
MP65.3458
03FEB98

HYDRAULIC SCHEMATIC
400 SERIES LEVELING SYSTEM WITH KICK-DOWN JACKS



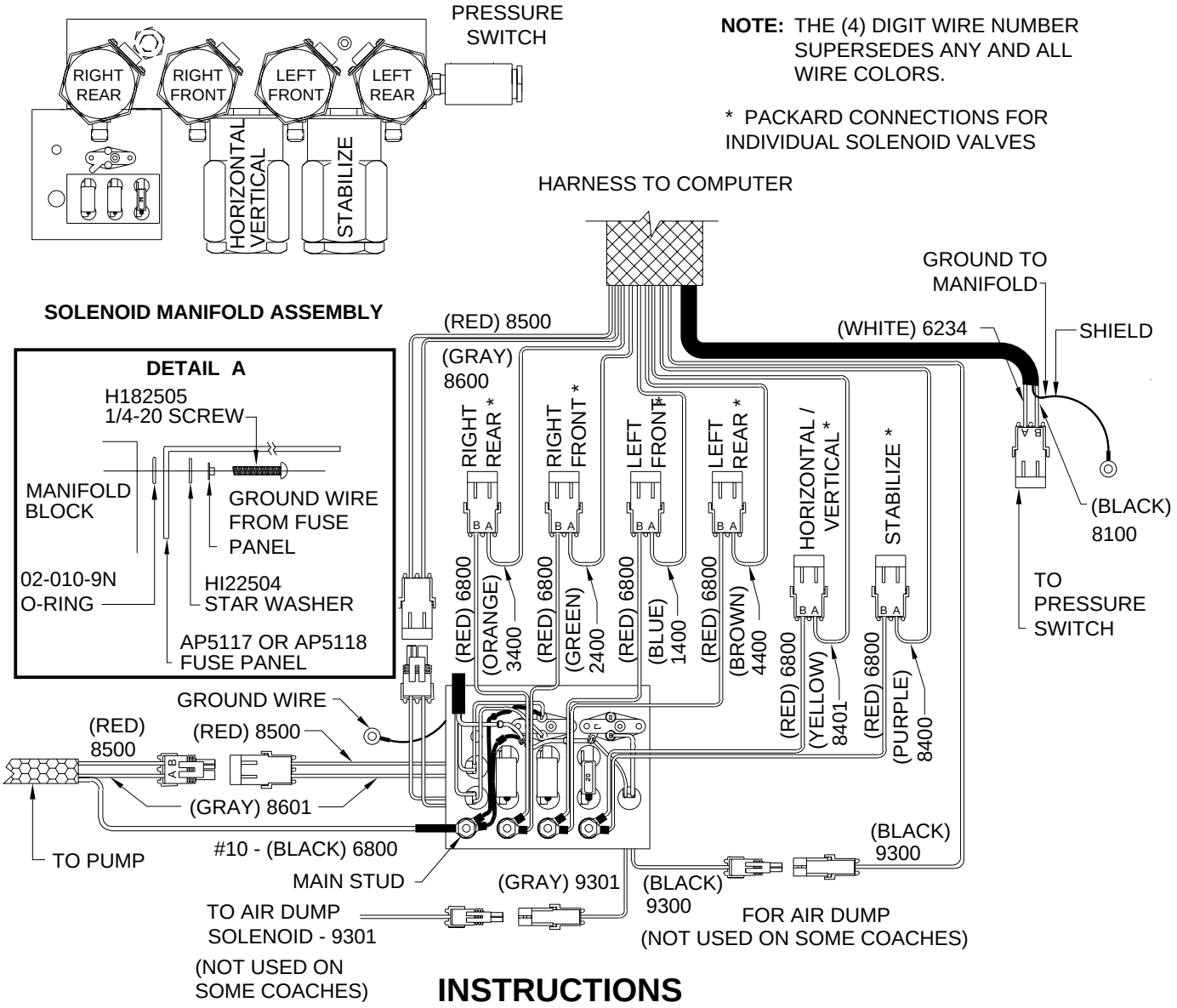
MP65.3460
29JAN98

HYDRAULIC SCHEMATIC
400 SERIES LEVELING SYSTEM WITH STRAIGHT-ACTING JACKS



MP65.3462
03FEB98

ELECTRICAL CONNECTION DIAGRAM
3 FUSE PANEL



NOTE: THE (4) DIGIT WIRE NUMBER SUPERSEDES ANY AND ALL WIRE COLORS.

* PACKARD CONNECTIONS FOR INDIVIDUAL SOLENOID VALVES

INSTRUCTIONS

1. THOROUGHLY CLEAN MANIFOLD AND ATTACH FUSE PANEL USING INTERNAL STAR WASHERS FOR GROUNDING PURPOSES. (SEE DETAIL A)

2. IF FUSE PANEL IS REMOTE MOUNTED, THE PANEL MUST BE GROUNDED TO THE FRAME OF THE COACH WITH #14 AWG WIRE.

3. THE TERMINAL ON #10 BLACK WIRE IS TO BE CLEANED AND ATTACHED DIRECTLY TO THE MAIN STUD. AN INTERNAL STAR WASHER IS TO BE USED.

4. THE TERMINALS OF THE 6 RED WIRES ARE TO BE CLEANED THOROUGHLY PRIOR TO ATTACHMENT. USE ONLY ONE NUT AND INTERNAL STAR WASHER FOR EACH FUSE STUD. DO NOT ATTACH BY ENTRAPPING THE TERMINALS BETWEEN 2 NUTS.

IMPORTANT: ONLY 2 RED WIRES SHOULD BE ATTACHED TO EACH TERMINAL.

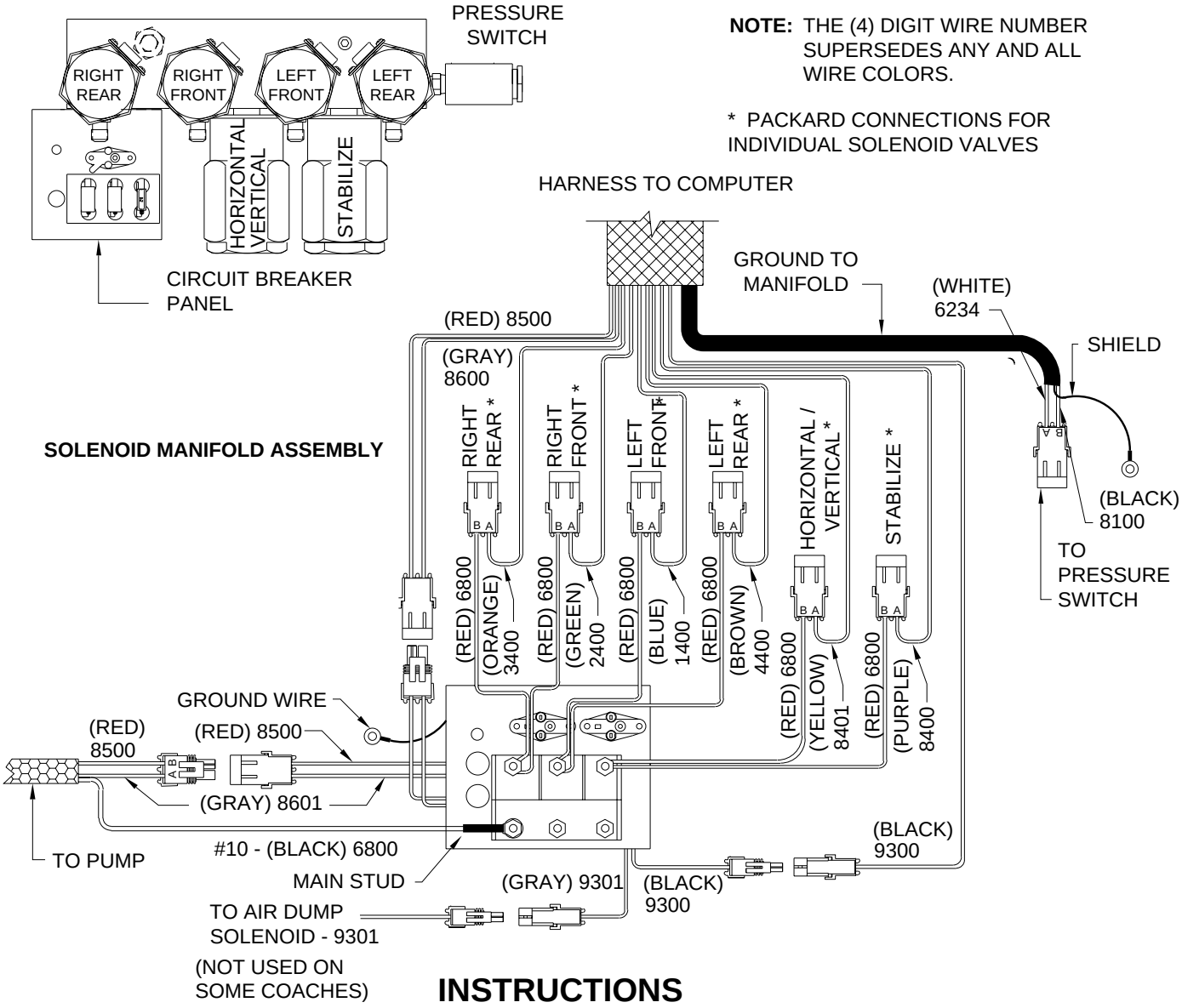
5. THE SOLENOID MANIFOLD MUST BE GROUNDED TO THE FRAME OF THE COACH. IF A GROUND WIRE IS REQUIRED, IT MUST BE #10 OR LARGER.

6. ALL CONNECTIONS MUST BE FREE OF DIRT AND CORROSION.

7. ALL COMPONENTS ARE TO BE CONNECTED AND THE GROUNDS ARE TO BE MADE PRIOR TO ENERGIZING AND OPERATING THE SYSTEM.

8. COAT ALL SCREW TYPE WIRE CONNECTIONS WITH A PROTECTIVE SEALANT SUCH AS KRYLON 1307.

ELECTRICAL CONNECTION DIAGRAM
3 BREAKER PANEL



INSTRUCTIONS

1. THOROUGHLY CLEAN MANIFOLD AND ATTACH FUSE PANEL USING INTERNAL STAR WASHERS FOR GROUNDING PURPOSES.

2. IF FUSE PANEL IS REMOTE MOUNTED, THE PANEL MUST BE GROUNDED TO THE FRAME OF THE COACH WITH #14 AWG WIRE.

3. THE TERMINAL ON #10 BLACK WIRE IS TO BE CLEANED AND ATTACHED DIRECTLY TO THE MAIN STUD. AN INTERNAL STAR WASHER IS TO BE USED.

4. THE TERMINALS OF THE 6 RED WIRES ARE TO BE CLEANED THOROUGHLY PRIOR TO ATTACHMENT. USE ONLY ONE NUT AND INTERNAL STAR WASHER FOR EACH FUSE STUD. DO NOT ATTACH BY ENTRAPPING THE TERMINALS BETWEEN 2 NUTS.

IMPORTANT: ONLY 2 RED WIRES SHOULD BE ATTACHED TO EACH TERMINAL.

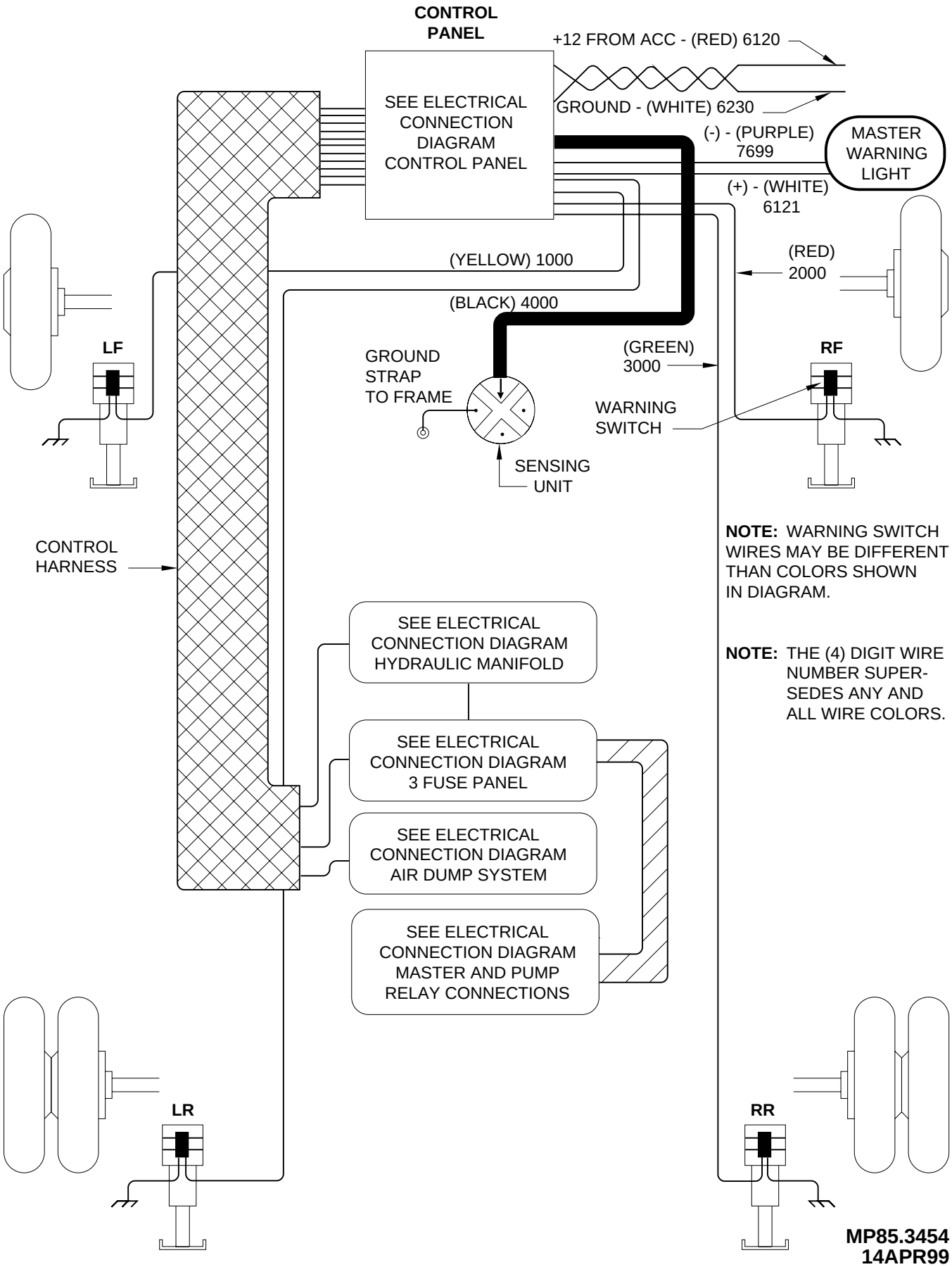
5. THE SOLENOID MANIFOLD MUST BE GROUNDED TO THE FRAME OF THE COACH. IF A GROUND WIRE IS REQUIRED, IT MUST BE #10 OR LARGER.

6. ALL CONNECTIONS MUST BE FREE OF DIRT AND CORROSION.

7. ALL COMPONENTS ARE TO BE CONNECTED AND THE GROUNDS ARE TO BE MADE PRIOR TO ENERGIZING AND OPERATING THE SYSTEM.

8. COAT ALL SCREW TYPE WIRE CONNECTIONS WITH A PROTECTIVE SEALANT SUCH AS KRYLON 1307.

ELECTRICAL CONNECTION DIAGRAM
400 SERIES LEVELING SYSTEM
WITH OR WITHOUT SUSPENSION AIR DUMP



NOTE: WARNING SWITCH WIRES MAY BE DIFFERENT THAN COLORS SHOWN IN DIAGRAM.

NOTE: THE (4) DIGIT WIRE NUMBER SUPERSEDES ANY AND ALL WIRE COLORS.

MP85.3454
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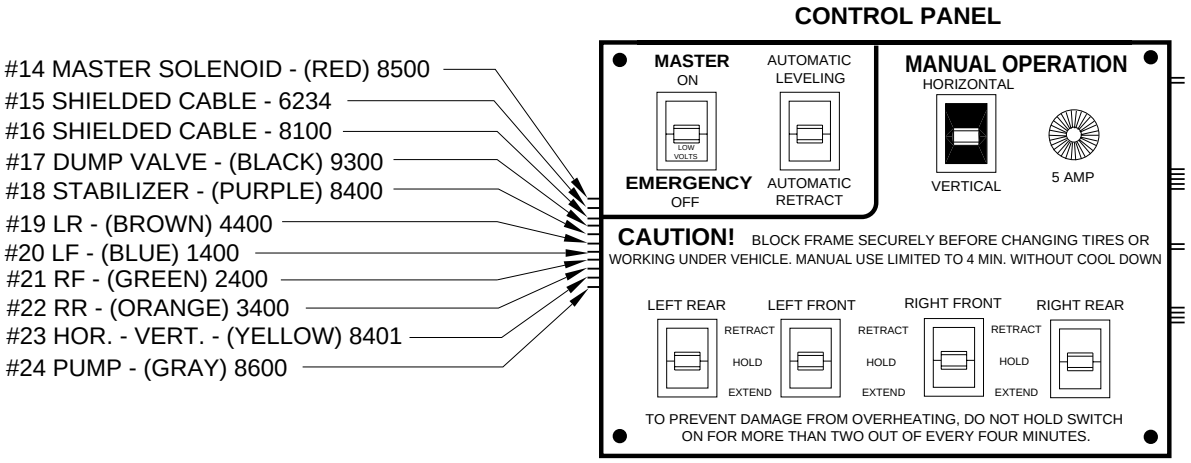
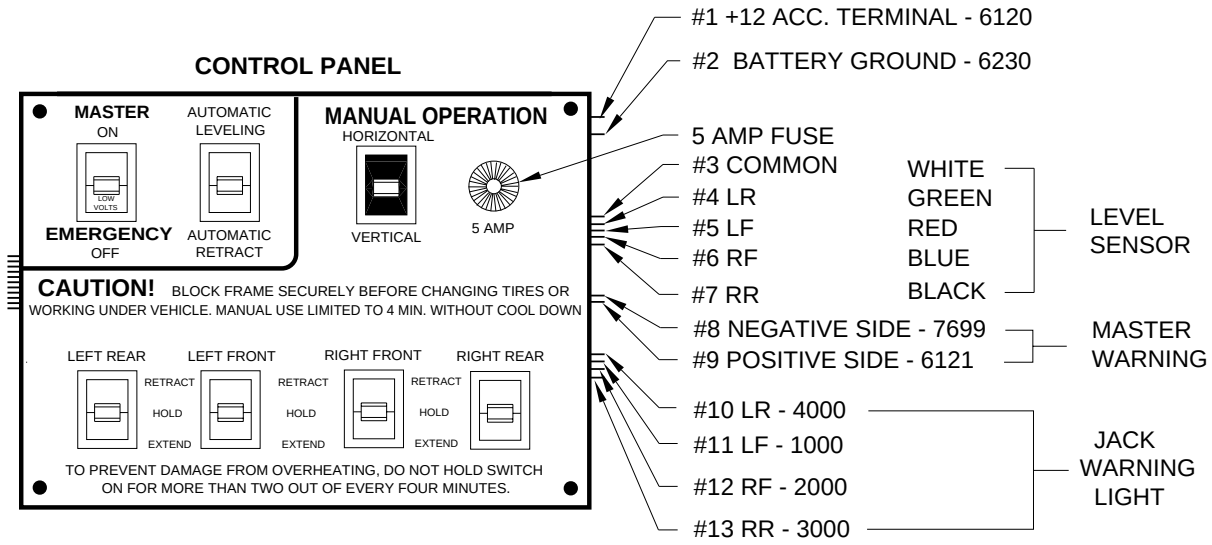
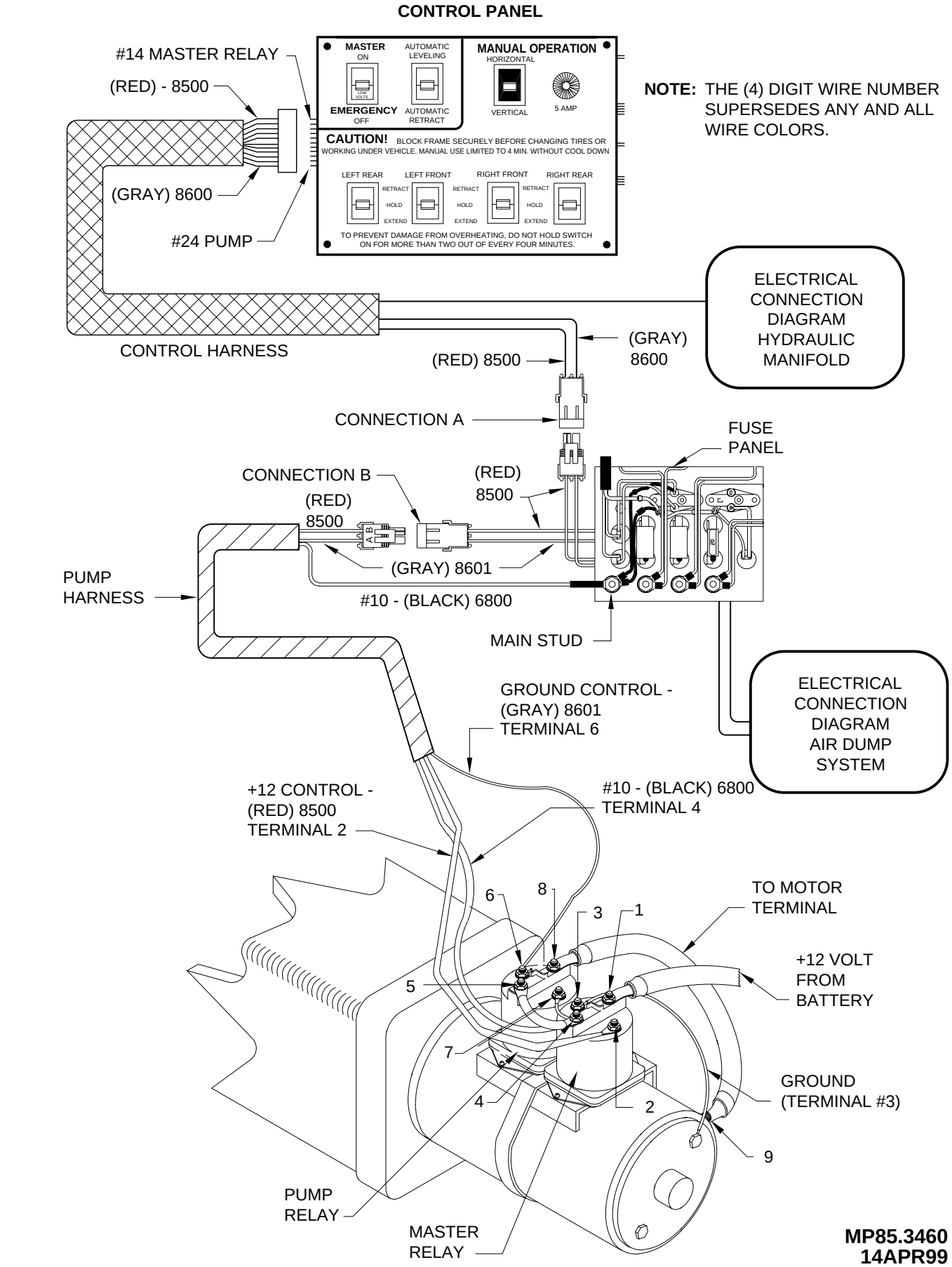
ELECTRICAL CONNECTION DIAGRAM
CONTROL PANEL
WITH PADDLE SWITCH TYPE CONTROLS





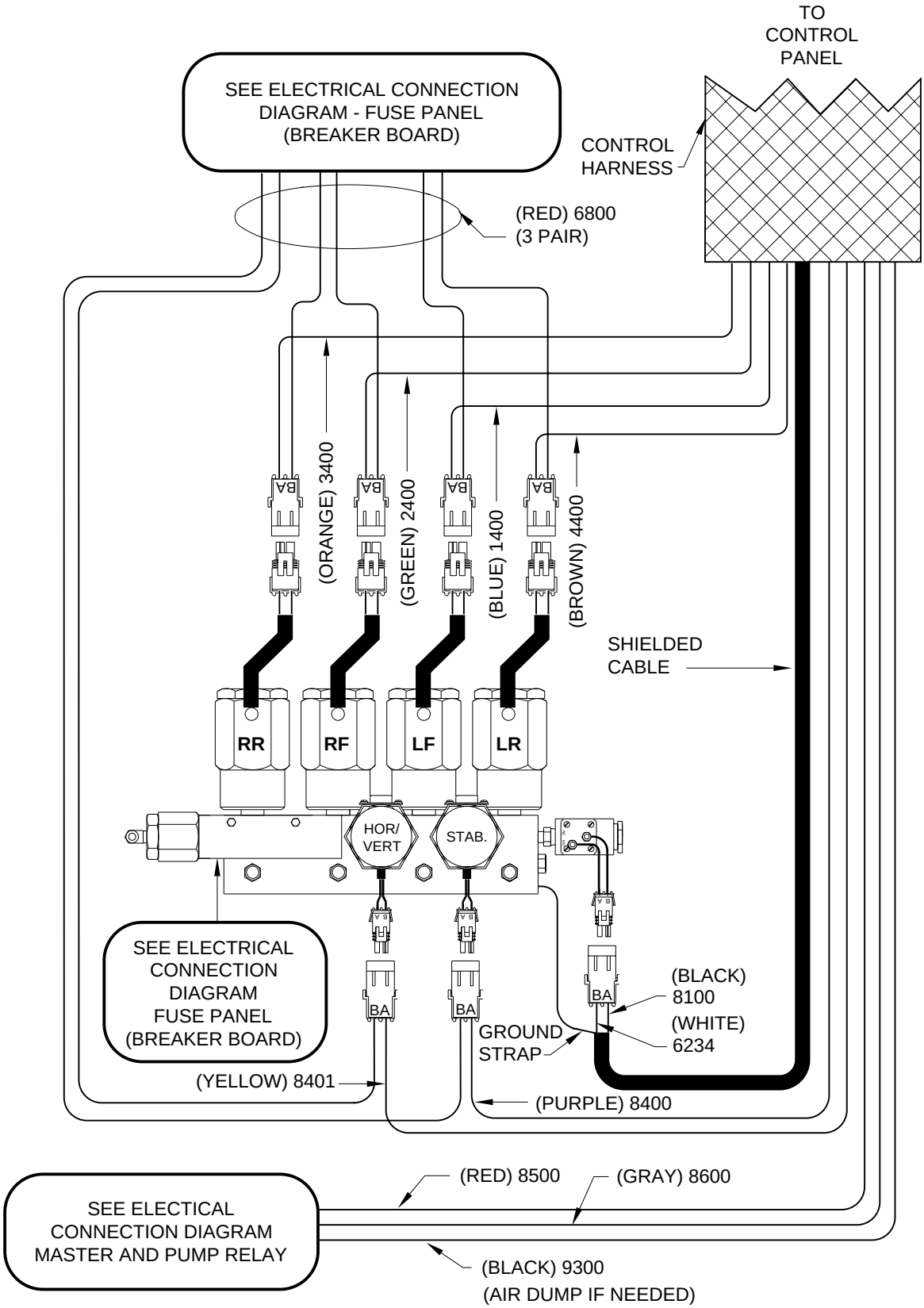
NOTE: THE (4) DIGIT WIRE NUMBER SUPERSEDES ANY AND ALL WIRE COLORS.

ELECTRICAL CONNECTION DIAGRAM
MASTER AND PUMP RELAY CONNECTION



MP85.3460
14APR99

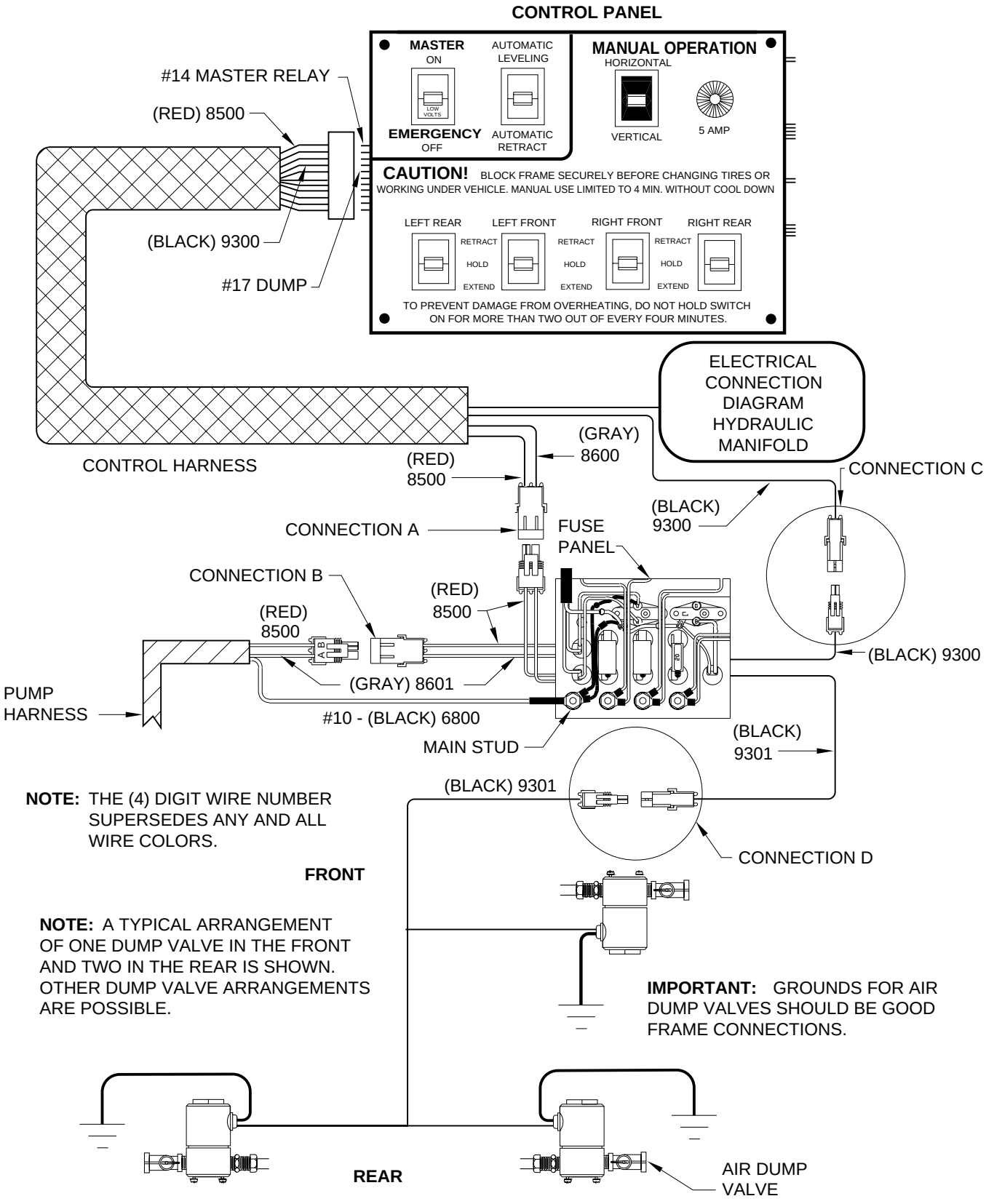
ELECTRICAL CONNECTION DIAGRAM
HYDRAULIC MANIFOLD



NOTE: THE (4) DIGIT WIRE NUMBER SUPERSEDES ANY AND ALL WIRE COLORS.

MP85.3462
14APR99

ELECTRICAL CONNECTION DIAGRAM
AIR DUMP SYSTEM



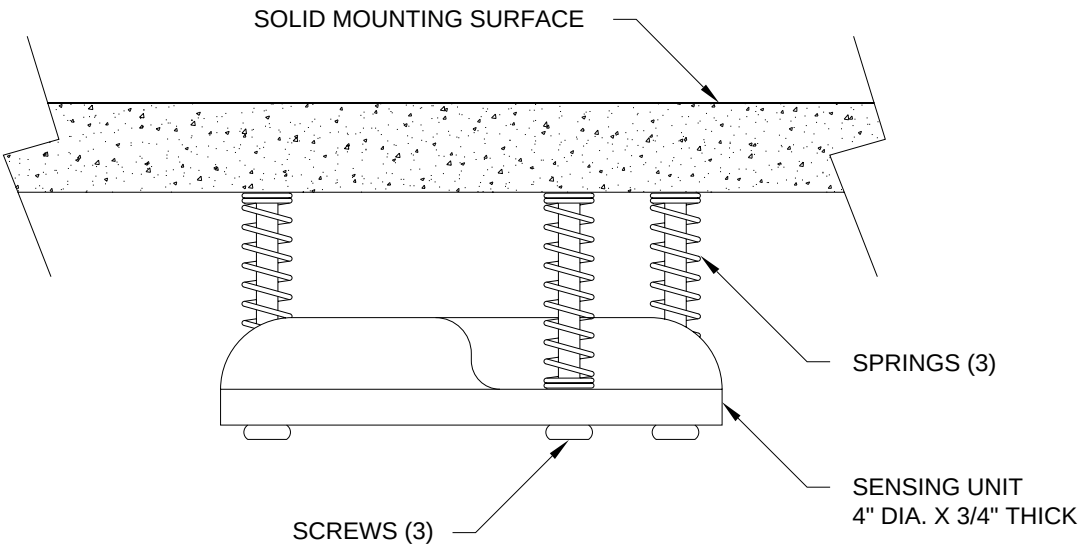
MOUNTING AND ADJUSTMENT INSTRUCTIONS
LEVEL SENSING UNIT

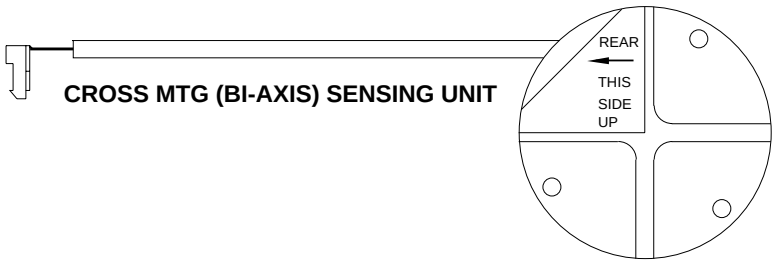
The sensing unit must be mounted to a solid surface and must not be exposed to any heat sources. Toward the middle of the vehicle but outside the frame rails is best. The sensing unit may be mounted between frame rails on pusher vehicles and trailers. The sensing unit may be mounted in a compartment but needs to be protected from stored objects. It is critical that the sensing unit is mounted in the proper position according to the sticker on the sensing unit. (See figure below). The springs should be compressed to approximately 1.25 inches.

The correct method for adjusting the sensor is as follows:

First, level the vehicle by placing a 24" level in the center of the vehicle on the floor. With the vehicle level adjust the sensing unit until all yellow lights are out. This is done by drawing up or backing out the sensing unit screws. If a front light is on, adjust the front screw. If a side light is on adjust the side screw. If a rear light is on adjust the rear screws. One or more screws may have to be adjusted to turn the yellow lights out. After adjustment has been made, pull down on the sensing unit to make sure the unit is bottomed out on the screw heads. Check to make sure all yellow lights are out. If not, readjust. Rock the vehicle and recheck for yellow lights, readjust if needed.

NOTE: The sensing unit has an accuracy tolerance of +/- 1" side to side and +/- 5.4" front to rear on a 36' vehicle.





CROSS MTG (BI-AXIS) SENSING UNIT